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Cover illustrations are derived from climate-change research carried out by the UBC Centre for Forest Conservation Genetics and supported by the Forest Genetics Council of BC. Map colours depict (from top to bottom) historic average mean annual temperatures for BC, and forecasts for 2020, 2050 and 2080. Data were generated using the ClimateBC model (Wang et al. 2006a). Current lodgepole pine natural-stand seed planning zones are shown on each map.

In the central graph, each curve illustrates the productivity response (stem volume per ha) to mean annual temperature for a different lodgepole pine seed source (Wang et al. 2006b). The color scheme below the x-axis represents mean annual temperature using the same colour scale as the maps. These curves show: 1) lodgepole pine populations are predicted to vary substantially in their response to climate warming; 2) populations from the western United States are not necessarily a good choice for BC's future climates; 3) populations with broad adaptability to climate are mostly from southern BC; and 4) the potential for using specific seed sources to mitigate productivity losses due to climate change is substantial. Further information is available at: www.genetics.forestry.ubc.ca/cfgc

Thanks to Christine Chourmouzis, Tongli Wang, and Rich Rawling for image preparation.

References

Wang, T., A. Hamann, D. Spittlehouse and S.N. Aitken. 2006a. Development of scale-free climate data for western Canada for use in resource management. International Journal of Climatology 26: 383-397.

Wang, T.L., A. Hamann, A. Yanchuk, G.A. O'Neill and S.N. Aitken. 2006b. Use of response functions in selecting lodgepole pine populations for future climates. Global Change Biology 12: 1-13.

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Acknowledgements

This Annual Report presents the 2006/07 financial information and performance indicators for activities planned and delivered under the Business Plan of the Forest Genetics Council of BC, and for the Forest Investment Account Tree Improvement Program. For more program detail, readers are directed to the FGC Business Plan for 2006/07, and the Tree Improvement Program Projects Report for 2006/07. This Annual Report is shortened from previous years as a cost-saving measure and to eliminate overlap with the FGC Business Plan.

JACK WOODS
PROGRAM MANAGER
FOREST GENETICS COUNCIL
OF BRITISH COLUMBIA

All participants in this provincial program deserve recognition and acknowledgement for their enthusiasm and support during the year. In particularly I would like to thank FGC Co-Chairs Dale Draper and John Elmslie, Coast and Interior TAC chairs Annette Van Niejenhuis and Michael Carlson, Genetic Conservation TAC chair, Dave Kolotelo, Pest Management TAC chair Robb Bennett, Extension TAC chair Chris Hawkins, and Genetic Resource Information Management Chair, Leslie McAuley. The leadership shown by all subprogram chairs is key to overall program success.

All members of the Forest Genetics Council and Technical Advisory Committees are thanked for their careful deliberations, contributions, and support. They are listed on the back page of this Annual Report.

My appreciation also goes to Roger Painter (FIA Tree Improvement Program Administrator) for another year of effort and cooperation. 2006/07 was Roger's last full year in this role, as he will embark on a much-deserved retirement in 2007.

Finally, Provincial Chief Forester, Jim Snetsinger, and Deputy Chief Forester, Henry Benskin, are thanked for their important contribution and guidance.

Photo credits:
M. Carlson, A. van Niejenhuis, J. Woods.

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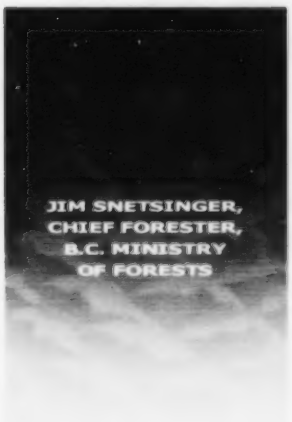
Message from the Chief Forester



JIM SNETSINGER, CHIEF FORESTER, B.C. MINISTRY OF FORESTS

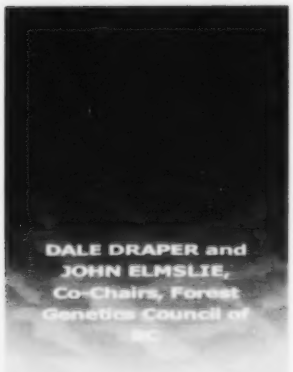
Forest genetic conservation and management (GRM) activities in British Columbia continue to make substantial positive contributions to sustainable forest management and timber supply. These contributions are only possible because of the hard work of many participants from industry, universities, the consulting community, Canadian Forest Service and, of course, the BC Ministry of Forests and Range. Their commitments and cooperation make the BC Forest Genetics Council, and its various subprograms, a model of success.

Timber losses to mountain pine beetle (MPB) and associated forest management issues remain dominant drivers for many forest operations and programs in BC. Provincial planting remains high with approximately 266 million seedlings being requested in the 2007sowing year. While this number is down about four percent from 2006, it remains well above the expected long-term average. Seed supply for this large planting program has not, in general, been a problem, but there is concern over potential shortages appearing for some operators in certain species and areas. Provincial seed orchards are increasing production, and many operators are collecting cones, mostly lodgepole pine, in superior provenance stands. These additions to the provincial seed supply will ensure that seed shortages do not hamper on-going reforestation efforts. Our challenge remains one of producing high genetic-worth (GW) seed, and I'm pleased to see that orchard production continues to rise towards the objectives set by Council. This high GW seed will play an important role in mitigating the impacts of mid- and longer-term declines in timber supply in many management units; particularly those impacted by the MPB.

Climate change and carbon management are new challenges facing forest management. The matching of seedlots to future climate conditions (i.e. facilitated migration) is one means by which we can proactively respond to climate change. Adjustments to seed transfer standards require careful technical and policy analyses and implementation must effectively match the best available science with operational considerations. I anticipate considerable work by Council and its affiliated committees in these areas over the coming years.

During the period of this report, I have worked with Council as sponsor of the Forest Genetic Resource Conservation and Management (GRM) Challenge Dialogue. This initiative will facilitate stakeholder input in developing new strategic direction for FGC-led programs. I anticipate it's completion in 2008 and a new FGC Strategic Plan to guide GRM in BC over the ensuing years.

Craig Sutherland, my recently appointed Deputy Chief Forester, and I look forward to working with Council in 2007/08 and beyond in meeting their renewed long-term objectives.



DALE DRAPER and JOHN ELMSLIE, Co-Chairs, Forest Genetics Council of BC

Message from Forest Genetics Council Co-Chairs

Mountain pine beetle (MPB) remains the primary forest management concern on a large percentage of BC's provincial forests, however, other important issues continue to emerge, including climate change response and industry competitiveness in face of declining markets and a rising currency.

Genetic resource management (GRM) offers a means to proactively respond to changing climates through the science-based matching of genotypes (seedlots) to particular geographic and climatic envelopes. With the modeling work completed by the UBC Centre for Forest Genetic Conservation, we have improved tools that will support decisions on how to adjust seed transfer standards to best match likely future climates with seedlots best adapted to those climates. This process of facilitated migration is a daunting task in a landscape as large and diverse as BC, and will take the combined expertise and cooperation of many people involved with Council and outside our normal GRM domain. We are fortunate to have a long history of genecology research, substantial expertise, and the collective will to tackle this issue, and we're confident that further contributions will be made to forest management through the development of a proactive plan for seed transfer change over the next few years.

Provincial sowing remained high in the 2007 sowing year due to MPB salvage and associated planting programs. Lodgepole pine orchards established in the early part of this decade are beginning to produce seed, and will help with seed needs over the next decade. The increased use of high genetic-worth seed in MPB-impacted areas will assist with the mitigation of timber-supply declines in the post-MPB era. All contributions to enhance timber supply are important in many parts of the interior.

As we move forward through 2007 and into 2008, Council will complete the stakeholder Challenge Dialogue process and the development of a new Strategic Plan to lead us into the next era. We're pleased at the response to this process to date, and look forward to the new directions that emerge.

Finally, we would like to recognize and sincerely thank the many industry and government staff whom contributed to the provincial genetic resource management program over the past year. We would also like to recognize the important financial support received from the Forest Investment Account Tree Improvement Program. This funding is instrumental to the success of forest genetic resource management province-wide.

1.0 Forest Genetic Resource Management in British Columbia

Forest genetic resource management (GRM) encompasses the conservation, controlled use, and enhancement of genetic resources of forest tree species, as well as related communication and extension activities. In British Columbia, GRM is a cooperative effort.

The Forest Genetics Council of British Columbia (FGC) coordinates a provincial GRM program that is implemented by stakeholders in the forest industry, Ministry of Forests and Range (MFR), Canadian Forest Service (CFS), and universities.

During the term of this report, the provincial Forest Investment Account Tree Improvement Program (FIA) was a major funding source for GRM in British Columbia. Industry, MFR, and university cooperators also contributed substantial resources.

This Annual Report describes progress on work outlined in the FGC Business Plan for 2006/07. The Business Plan and this Annual Report focus on FIA funding, although performance indicators used at both the project and provincial levels represent the combined effort of all cooperators and resources.

“Forest genetic resource management includes the conservation, controlled use, and enhancement of genetic resources of forest tree species.”

1.1 About the Forest Genetics Council of British Columbia

The FGC is a multi-stakeholder group representing the forest industry, MFR, Canadian Forest Service, and universities. Council's mandate is to champion forest GRM, to oversee strategic and business planning for a cooperative provincial GRM program, and to advise the province's Chief Forester on policies related to GRM.

The Council provides a forum for stakeholder representatives to set goals and objectives, and for the development of annual business plans to fulfill them.[1] The following objectives are set out in Council's Strategic Plan.

“The Forest Genetics Council represents the B.C. forest industry, Ministry of Forests and Range, Canadian Forest Service, and universities.”

[1] For more information on the Forest Genetics Council, see *http://www.fgcouncil.ca.*

As set out in the 2004 Strategic Plan, Council's goal is to:

Lead the cooperative management of tree genetic resources in British Columbia consistent with scientific and conservation principles, by:

- *Increasing the average volume gain of select seed used for Crown land reforestation to 20% by the year 2020,*
- *Increasing select seed use to 75% of the provincial total sown by 2013,*
- *Supporting genetic conservation research and the cataloguing of indigenous-tree genetic resources,*
- *Coordinating stakeholder activities and securing resources to meet Business Plan priorities, and*
- *Monitoring progress in all aspects of genetic resource management.*

Business Planning

Annual FGC Business Plans outline the activities and budgets of the provincial forest genetic resource management program.

FGC Technical Advisory Committees (TACs) provide technical and policy information to Council and contribute to the development of annual plans and associated budgets to achieve FGC goals and objectives. TAC's and Species Committees provide the forum for stakeholder focus on technical, forest management, and budget needs. Council reviews all strategies, plans, or recommendations from the TACs.

"TAC's and Species Committees provide the forum for stakeholder focus on technical and forest management needs."

Greg Pieper (right) of Tolko Industries Ltd. and Keith Thomas of the MFR inspect a lodgepole pine ramet in Tolko's Thompson Okanagan high-elevation seed orchard managed in partnership with SelectSeed Ltd.

2.0 Budget Summary and Provincial Progress Indicators

2.1 Budgets and Expenditures

Forest Investment Account Tree Improvement Program allocations and expenditures for the 2006/07 fiscal year are shown in Table 1. The table does not include the in-kind, staff, and other substantial inputs by industry, MFR, and university cooperators who contribute to the success of genetic resource management activities in B.C.

Subprogram	Budget ($)	Expenditures ($)
Genetic Conservation	270	270
Tree Breeding	2,548	2,568*
Operational Tree Improvement Program (OTIP)	809	847*
Extension and Communication	120	117
Genetic Resource Information Management	80	75
Seed Orchard Pest Management	436	315
Administration	58	58
Incremental projects	682	558
SelectSeed Ltd. orchards and FGC program management	867	867**
Forest Investment Account Tree Improvement Program Contribution	**5,870**	**5,855**

Table 1
Summary of Forest Investment Account TIP budgets and expenditures for the period April 1, 2006 through March 31, 2007 ($ x 1000).

* Additional expenditure approved by FGC

** SelectSeed FIA allocation listed. Total SelectSeed expenditure $873,039; difference supported through seed sale revenue and investment income.

2.2 Provincial Performance Indicators

Two of the principal objectives in the FGC Strategic Plan are to increase select seed use to 75% of total provincial sowing by 2013 and to increase the average volume gain (genetic worth for stem-volume growth, or GWg) of select seed to 20% by 2020. Figures 1 and 2 show, respectively, actual and forecast values for select seed use and GWg for the period 1995–2020.

The reduced percentage of select seed use in the period from 2005 to 2007 (Figure 1) reflects increased sowing in response to Allowable Annual Cut and harvest increases driven by MPB. During 2000 and 2001, total provincial sowing averaged about 220 million per year. In 2006, provincial sowing was 278 and 265 million, respectively.

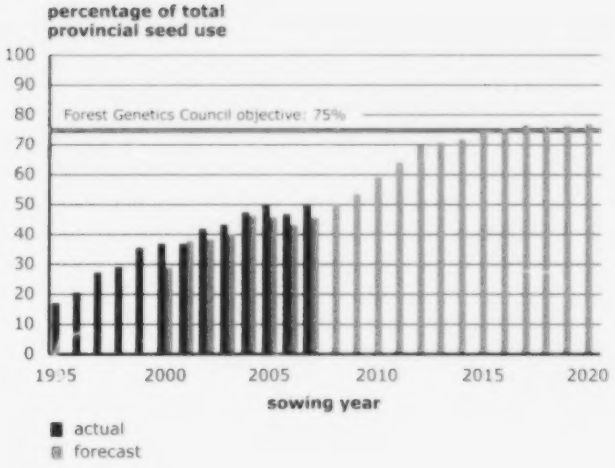


Figure 1
Actual and Species-Plan forecasts of select-seed production as a percentage of provincial seed use.

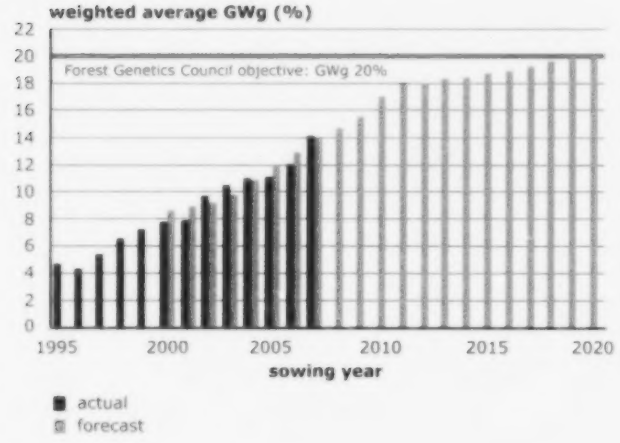


Figure 2
Actual and Species-Plan forecasts of the average genetic worth for stem-volume growth (GWg) of select seed sown in B.C.

GWg of orchard seed used (Figure 2) rose strongly in the 2007 sowing year, and reflects increasing amounts of high gain interior spruce, coastal Douglas-fir, and lodgepole pine. These gains reflect the efforts over the last 7 years to upgrade orchard quality through the OTIP subprogram.

3.0 Forest Genetics Council and Committee Activity 2006/07

During the period of this report, the Forest Genetics Council met quarterly. In addition to subprogram progress reported below, the primary issues and activities included:

- developing a Business Plan and a Forest Investment Account Tree Improvement Program budget recommendation for the 2007/08 fiscal year, including planning and project development for Incremental FIA support;
- initiating the development of a comprehensive plan for genetic conservation;
- completing a seed-need analysis of the additional planting demand anticipated due to mountain pine beetle driven harvest lifts, and associated seed-orchard needs;
- managing committee mandate, structure, and activities in support of objectives.

3.1 Coastal and Interior Technical Advisory Committees (CTAC and ITAC)

The Interior Technical Advisory Committee (ITAC) and affiliated interior Species Committees met in Vernon in November 2006. The Coastal Technical Advisory Committee (CTAC) and affiliated Species Committees met in February 2007. Principal activities for both committees included:

- reviewing species plan strategies and Species Committee reports;
- reviewing breeding program activities, progress, and plans;
- coordinating breeding and orchard strategies;
- providing input to the FGC;
- developing the Operational Tree Improvement Program (OTIP) project eligibility list;
- reviewing long-term seed-need forecasts.

3.2 SelectSeed Company Ltd. Board of Directors

SelectSeed is a registered company that is wholly owned by the FGC through the BC Forest Genetics Society. The SelectSeed Board met in June and October 2006, and February 2007. Principal activities included:

- business planning for orchard development activities, and approval of a SelectSeed Business Plan for the 2007/08 fiscal year;
- receiving and approving audited financial statements for the 2005/06 fiscal year, and addressing business items related to annual reporting requirements of the *Business Corporations Act;*
- reviewing progress in SelectSeed orchard developments, and receiving reports on activities; and
- coordinating and updating the principal contracts guiding orchard development and management activities.

3.3 Other Committees

- The **Extension TAC** met in November, 2005. Activities included review of projects and business planning for 2007/08.
- The **Genetic Conservation TAC** met in November, 2006 and February, 2007. Activities included development of a framework plan for a forest-tree genetic conservation program that will expand upon and operationalize the gap analysis work of the University of British Columbia (UBC) Centre for Gene Conservation. Also, projects and budget recommendations for the 2007/08 fiscal year were developed.
- The **Pest Management Technical Advisory Committee** met in October, November, and December of 2006 and in February of 2007. The primary activity was the implementation of projects developed as part of the expanded cone and seed pest management program initiated in 2005, and the development of projects and budgets for 2007/08.
- The **Genetic Resource Information Management Steering Committee** met in February 2007. Activities included the presentation of project updates, and the development of a business plan framework for 2007/08.
- The **Cone Induction Steering Committee** met in March 2007 to receive a project report from the principle researchers and to develop project plans for the 07/08 fiscal year.
- The **Applied Biotechnology Steering Committee** met in April 2006, and in January and February 2007 to receive reports and to develop projects and budgets for the 07/08 fiscal year.

4.0 Subprogram Summaries - 2006/07

> "Council's genetic conservation objectives are met primarily through the CFGC."

4.1 Genetic Conservation Subprogram

The genetic resources of British Columbia's indigenous tree species underpin forest and landscape diversity, provincial breeding programs for economically important species, and the current and future adaptation of populations to their local climate. The maintenance of these resources is fundamental to sustainable forest management. Council's genetic conservation objectives are currently met primarily through the Centre for Forest Genetic Conservation (CFGC) in the Faculty of Forestry at UBC.[2]

Research activities of the CFGC fall into four main categories: (1) cataloguing the current protection of genetic diversity for all indigenous tree species in British Columbia in protected areas (*in situ* conservation in parks and ecological reserves), through seed storage (*ex situ* conservation), and in the provincial tree breeding programs (*inter situ* conservation); (2) developing an overall genetic conservation strategy for BC; (3) predicting the response of forest-tree populations to climate change; and (4) gaining knowledge about the genetics and conservation needs of non-commercial tree species. Climate-change related research to date has been conducted mostly with economically and ecologically important, widespread species. Species-specific genetic issues associated with at-risk, rare, or declining tree species have been investigated in some studies. Analyses to date show good protection levels for most tree species; however, some gaps exist.

Accomplishments in 2006/07 include:

- Completion of a draft technical report detailing the *in situ* conservation status of 49 indigenous forest-tree species by BEC[3] zone.
- Release of a new version of the ClimateBC model that includes annual weather data for the past century as well as predicted future local climates for all of BC.
- Collection of increment cores from eight provenances of lodgepole pine growing in fifteen test sites across the province, and the measurement of annual radial growth to estimate population response to interannual climatic variation in order to better predict global warming impacts on tree growth.

[2] Web site: http://www.genetics.forestry.ubc.ca/cfgc.

[3] Biogeoclimatic zone

- Initiation of a seedling growth chamber experiment characterizing lodgepole pine and interior spruce population response to temperature, moisture, and carbon dioxide. Results will be compared to climate change response predictions obtained from long-term field provenance trials.
- Advancing broad scientific recognition of the overall conservation strategy developed for BC's indigenous-tree genetic resources through acceptance of three manuscripts for publication in peer-reviewed genetics journals.
- Publishing an article on predicted future distributions of climatic envelopes for BC's BEC zones and species in the journal Ecology. The "Flying BEC Zone" maps from this publication are widely distributed and displayed in the forestry and conservation community as well as in the popular press.
- Developing seed transfer recommendations, submitting two manuscripts, and publishing two additional articles in peer-reviewed journals related to the population genetics and conservation of whitebark pine. Initiating a research proposal to test facilitated migration as a conservation strategy for this rapidly declining species.
- Completion of range-wide seed collections and establishing genecological studies of Garry oak and Pacific dogwood. Continuing data collection for a genetic marker study of Pacific dogwood as a test case for genetic diversity of central, marginal and disjunct populations of a low-density broadleaf species.
- Communication of information from CFGC research projects, and educating forestry audiences about genetic conservation and climate change issues through frequent presentations at conferences and workshops, regular website updates, publication, participation in the preparation of news articles, and the development of a brief video presentation using ClimateBC and other climate change research.

Heidi Holtman picking spruce cones in Vernon Seed Orchard Company's Prince George low-elevation orchard.

Project	Planned products	Products achieved
Theoretical framework	1 draft report	Report completed
Cataloguing *in situ* protection	Ground truthing *in situ* conservation status	Recommendations for ground-truthing completed
Markers and theory for measuring diversity	1 final report	1 final report completed
Whitebark pine diversity and conservation	1 final report on genecology, inbreeding, and *ex situ* seed storage	1 report completed and submitted for publication
Genetic structure of non-economic species	2 progress reports (Pacific dogwood and Garry oak)	2 progress reports completed
Climate change and genetic conservation	2 progress reports: 2 scientific papers	2 progress reports completed
Response to climate change in support of seed zonation	1 progress report	Project developed and 1st year work completed; 1 progress report
Extension	300 clients served; / Web site updated	>300 clients served; website updated; >1000 unique visits to Web site

Table 2
Summary of Genetic Conservation projects, planned products and products achieved for the period April 1, 2006 through March 31, 2007.

4.2 Tree Breeding Subprogram

The Tree Breeding Subprogram seeks to understand and use the genetic variation of commercially and ecologically important tree species in B.C. This work includes genecology[4] research to develop seed transfer limits, and the continual improvement of the genetic worth (GW)[5] of seed and vegetative materials transferred to seed orchards. Tree breeding activities include selecting parents in wild stands, propagating, testing offspring, controlled breeding, establishing/maintaining/measuring trials, and associated research. The MFR Research Branch manages and carries out Tree Breeding Subprogram activities. FGC Interior and Coastal TACs, and their associated Species Committees, assist MFR tree breeders with planning priorities and budgets for the subprogram.

> *Tree breeding programs quantify genetic diversity to develop seed transfer limits, and to select parent trees for seed orchards.*

Figure 3 shows the allocation of effort to Tree Breeding Subprogram activities in 2006/07. Figure 4 compares the work completed under each activity to work planned for the fiscal year.

[4] Genecology is the study of relationships between genetic diversity and environments.

[5] Genetic worth is an estimate of the expected percentage difference between a selected seed or vegetative lot relative to a wild stand seedlot for a specific trait (e.g., growth, wood density, pest resistance) at a reference stand age of 60 years (80 years for interior spruce).

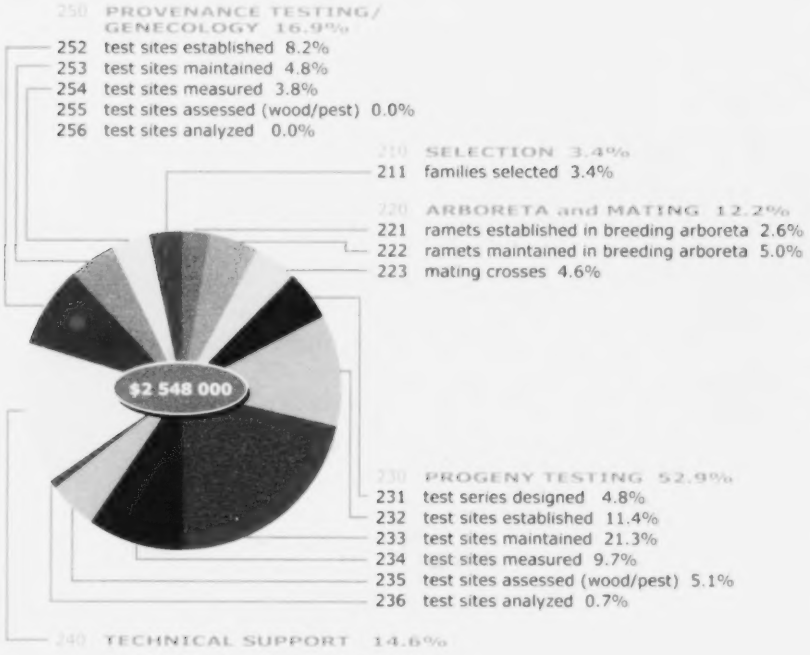

250 PROVENANCE TESTING/ GENECOLOGY 16.9%
252 test sites established 8.2%
253 test sites maintained 4.8%
254 test sites measured 3.8%
255 test sites assessed (wood/pest) 0.0%
256 test sites analyzed 0.0%
210 SELECTION 3.4%
211 families selected 3.4%
220 ARBORETA and MATING 12.2%
221 ramets established in breeding arboreta 2.6%
222 ramets maintained in breeding arboreta 5.0%
223 mating crosses 4.6%
$2 548 000
230 PROGENY TESTING 52.9%
231 test series designed 4.8%
232 test sites established 11.4%
233 test sites maintained 21.3%
234 test sites measured 9.7%
235 test sites assessed (wood/pest) 5.1%
236 test sites analyzed 0.7%
240 TECHNICAL SUPPORT 14.6%

Figure 3
Tree Breeding Subprogram budget allocations for 2006/07.

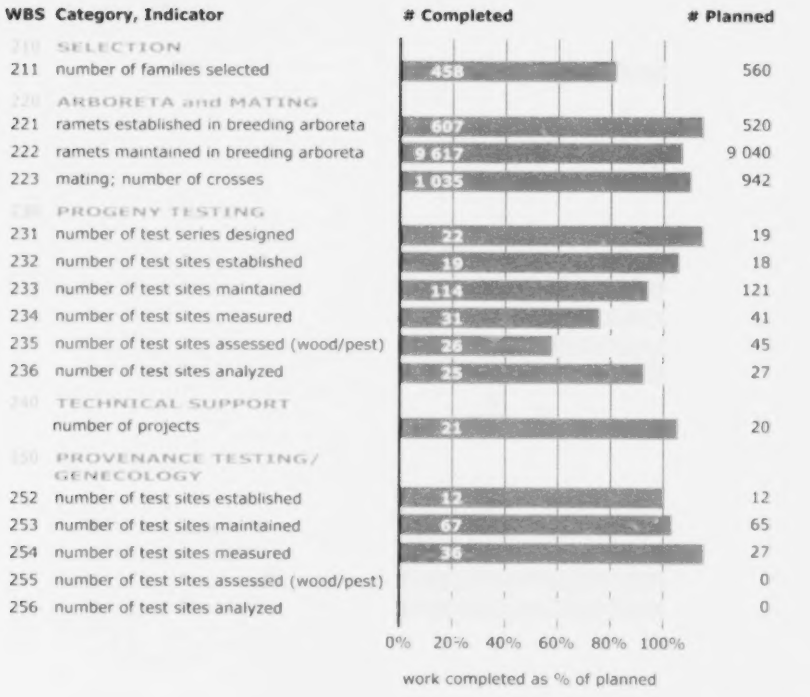

WBS Category, Indicator
Completed
Planned
210 SELECTION
211 number of families selected 458 560
220 ARBORETA and MATING
221 ramets established in breeding arboreta 607 520
222 ramets maintained in breeding arboreta 9 617 9 040
223 mating; number of crosses 1 035 942
230 PROGENY TESTING
231 number of test series designed 22 19
232 number of test sites established 19 18
233 number of test sites maintained 114 121
234 number of test sites measured 31 41
235 number of test sites assessed (wood/pest) 28 45
236 number of test sites analyzed 25 27
240 TECHNICAL SUPPORT
number of projects 21 20
250 PROVENANCE TESTING/ GENECOLOGY
252 number of test sites established 12 12
253 number of test sites maintained 67 65
254 number of test sites measured 36 27
255 number of test sites assessed (wood/pest) 0
256 number of test sites analyzed 0
0% 20% 40% 60% 80% 100%
work completed as % of planned

Figure 4
Tree Breeding Subprogram performance indicators for the period April 1, 2006 to March 31, 2007.

Interior Breeding Program Highlights

- Existing progeny and provenance tests of lodgepole pine were examined to better understand the underlying mechanisms of resistance to mountain pine beetle.
- Lodgepole pine wood density was mapped in a way that separates genetic and environmental effects. This will aid with the development of seed orchard populations with improved growth and wood quality in both current and future climates.
- Second-generation lodgepole pine selections for seed orchard populations were made in the Nelson and Thompson-Okanagan seed planning units.

Coastal Breeding Program Highlights

- Third-generation selections of Douglas-fir continued, with focus on growth rate, stem form, and wood density using new optimization techniques for selection.
- Red alder selections were made from a 12-year-old provenance-family trial. This material was made available for seed orchard development; the first broadleaf seed orchard in BC.
- Yellow cedar selections were made from the first series of clonal tests, and will be released for use in orchards and rooted-cutting populations.

"Third-generation selections continued for coastal Douglas-fir."

Provenance Testing and Genecology

Provenance testing and genecology work guide seed transfer, and provide an information base for decisions related to the deployment of genotypes in the provincial reforestation program. Increasingly, genecology data are linked to climate-change modeling and response. Highlights include:

- Genecology trials were sown for bigleaf maple; further expanding the test basis for broadleaf seed zones and efforts to increase the viability of planting programs for coastal broadleaf species.
- Development continued on a province-wide multi-species trial that will provide long-term data on the performance of a wide variety of selected populations in various climatic conditions.

"Genecology research provides an information base for seed transfer standards"

4.3 Operational Tree Improvement (OTIP) Subprogram

The OTIP Subprogram focuses on increasing the quality and quantity of seed produced from provincial seed orchards. It also provides technical support to improve orchard production and management.

"OTIP focuses on increasing the quality and quantity of seed produced from existing seed orchards."

OTIP projects are developed through a call-for-proposals that is based on Species Plan priorities. FGC Review Committees rank all proposals against FGC objectives and SPU priorities, based on technical merit, impact, value, and cost. The MFR Tree Improvement Branch administers OTIP on behalf of the Forest Investment Account and the FGC.

Figure 5 shows the allocation of funding to OTIP Subprogram activities in 2006/07. Figure 6 compares the work completed under each activity to work planned for the fiscal year.

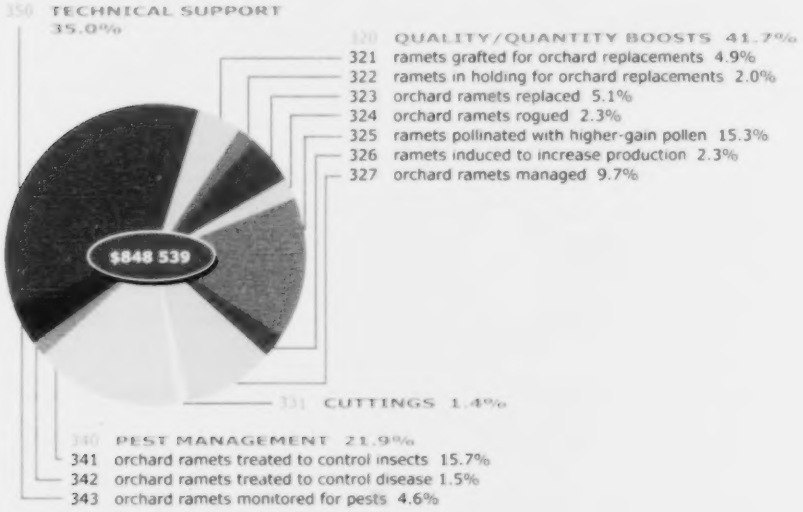

350 TECHNICAL SUPPORT 35.0%
320 QUALITY/QUANTITY BOOSTS 41.7%
321 ramets grafted for orchard replacements 4.9%
322 ramets in holding for orchard replacements 2.0%
323 orchard ramets replaced 5.1%
324 orchard ramets rogued 2.3%
325 ramets pollinated with higher-gain pollen 15.3%
326 ramets induced to increase production 2.3%
327 orchard ramets managed 9.7%
$848 539
331 CUTTINGS 1.4%
340 PEST MANAGEMENT 21.9%
341 orchard ramets treated to control insects 15.7%
342 orchard ramets treated to control disease 1.5%
343 orchard ramets monitored for pests 4.6%

Figure 5
OTIP Subprogram budget allocations for 2006/07.

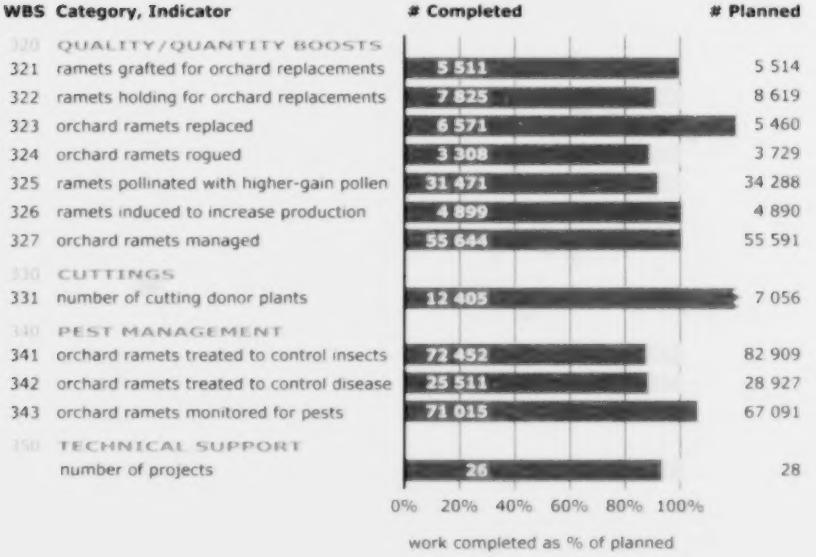

WBS Category, Indicator
Completed
Planned
320 QUALITY/QUANTITY BOOSTS
321 ramets grafted for orchard replacements 5 511 5 514
322 ramets holding for orchard replacements 7 825 8 619
323 orchard ramets replaced 6 571 5 460
324 orchard ramets rogued 3 308 3 729
325 ramets pollinated with higher-gain pollen 31 471 34 288
326 ramets induced to increase production 4 899 4 890
327 orchard ramets managed 55 644 55 591
330 CUTTINGS
331 number of cutting donor plants 12 405 7 056
340 PEST MANAGEMENT
341 orchard ramets treated to control insects 72 452 82 909
342 orchard ramets treated to control disease 25 511 28 927
343 orchard ramets monitored for pests 71 015 67 091
350 TECHNICAL SUPPORT
number of projects 26 28
0% 20% 40% 60% 80% 100%
work completed as % of planned

Figure 6
OTIP Subprogram progress, 2006/07.

Activities

OTIP projects generally met expectations[6]. The greatest proportion of subprogram expenditures supported seed quantity and quality boosts. This type of work is designed to increase both the amount of seed produced and the genetic worth of the seed. As younger orchards mature and produce more seed, projects of this type will remain the primary focus.

Technical support projects aid the development of more effective orchard management. Problems such as low seed set in lodgepole pine continue to receive attention. As methods develop, however, technical support investments are expected to diminish as a proportion of the subprogram. This trend is evident now, with lower technical project expenditures in the 2006/07 fiscal year than in previous years.

4.4 Expansion of Orchard Seed Supply Subprogram (SelectSeed Company Ltd.)

SelectSeed Company Ltd. is wholly owned by the B.C. Forest Genetics Society and reports to the FGC. SelectSeed's mandate is to develop and manage orchard expansions needed to meet FGC objectives, and to produce seed of high genetic quality for use in provincial reforestation programs. SelectSeed also provides program management services to the FGC.

> "*SelectSeed orchards are now entering the seed production phase.*"

SelectSeed's Business Plan and investments are a component of the long-term FGC business planning process. Management discretion lies with the SelectSeed Board of Directors, and is guided by the terms of the multi-year agreement between SelectSeed and the Province of British Columbia. The SelectSeed Business Plan is reviewed and approved annually by the FGC. Selectseed has entered into contracts with private orchard companies to develop and manage needed seed orchards.

SelectSeed spending is summarized in Figure 7 for 2006/07. Figure 8 compares the work completed under each activity to work planned for the fiscal year.

[6] For specific project details see the *Tree Improvement Program Project Report for 2006/07*

Figure 7
SelectSeed Co. budget allocations for 2006/07.

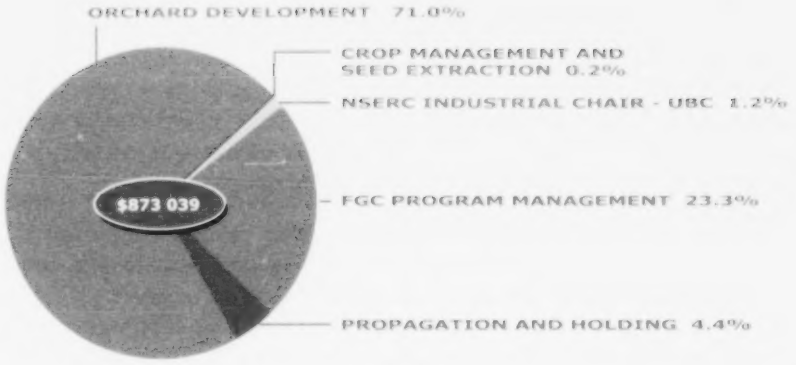
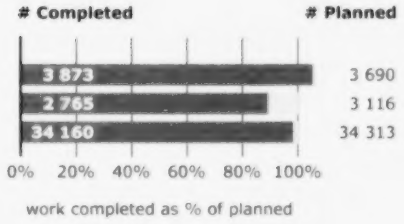

ORCHARD DEVELOPMENT 71.0%
CROP MANAGEMENT AND SEED EXTRACTION 0.2%
NSERC INDUSTRIAL CHAIR - UBC 1.2%
$873 039
FGC PROGRAM MANAGEMENT 23.3%
PROPAGATION AND HOLDING 4.4%

Figure 8
SelectSeed Co. performance indicators for 2006/07.

WBS	Category, Indicator
310	EXPANDED PRODUCTION
311	ramets grafted
313	ramets planted
315	ramets managed in orchards



"SelectSeed orchards are 97% established, with 34,400 ramets in 14 orchards."

Orchard Development and Production

In its seventh year, SelectSeed continues to focus on 14 seed orchards managed under contract with various operators. No new orchards were initiated during the year. Ongoing mortality, due primarily to graft incompatibility in lodgepole pine, has required replacement grafting and planting, however, the orchards are over 97% stocked. Further planting will diminish as the existing ramets age and interplanting small trees becomes unproductive. Total stocking across all orchards is over 34,400 of 35,210 planned. Crops were harvested from one Douglas-fir NE low, and three lodgepole pine orchards, and supplemental pollination was carried out in all nine lodgepole pine orchards for the harvest of crops in 2007.

SelectSeed Ltd. Management

SelectSeed activities in 2006/07 include:

- managing orchard and propagation contracts, orchard planning and support, scion collection, stock allocations, workplan development, and records maintenance;
- preparing a Business Plan and Annual Report covering business procedures, budgets, long- and short-term activities, and accomplishments;

- maintaining books of account and corporate records; managing audits and Board of Director procedures; and
- reporting on operations and finance to the FGC and FIA administrators.

FGC Program Management

FGC program management activities included developing the FGC Annual Report for 2005/06; organizing committee work for development of the 2007/08 FGC Business Plan; policy, committee, issue management, and reporting for the FGC; updating species plans; and coordinating FGC activities. During the reporting period, substantial effort was made to provincial long-term seed needs and to the Genetic Resource Management Challenge Dialogue undertaken by the FGC.

4.5 Extension and Communication Subprogram

The Extension and Communication Subprogram supports FGC goals and objectives through extension, communication, and education activities. These activities are developed and guided by the FGC Extension Technical Advisory Committee (ETAC), which includes representatives from government, industry, seed dealers, academia, and consultants.

Figure 9 shows funding allocations to the Extension and Communication Subprogram activities in 2006/07.

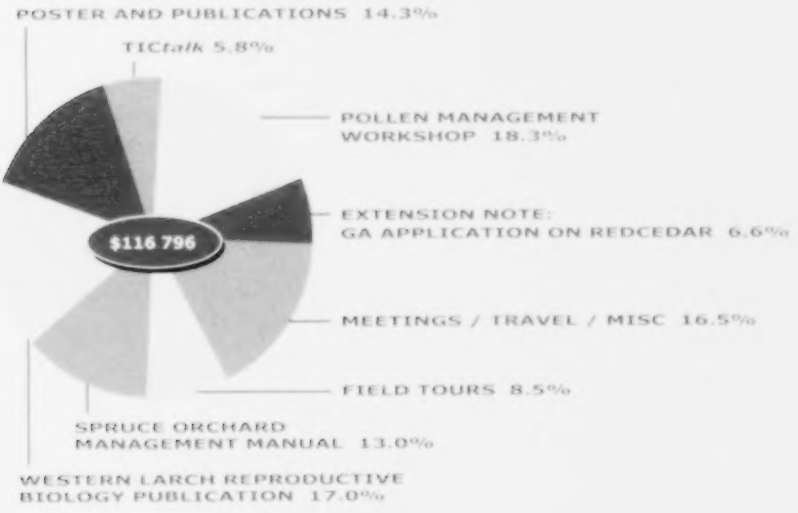

POSTER AND PUBLICATIONS 14.3%
TICtalk 5.8%
POLLEN MANAGEMENT WORKSHOP 18.3%
EXTENSION NOTE: GA APPLICATION ON REDCEDAR 6.6%
$116 796
MEETINGS / TRAVEL / MISC 16.5%
FIELD TOURS 8.5%
SPRUCE ORCHARD MANAGEMENT MANUAL 13.0%
WESTERN LARCH REPRODUCTIVE BIOLOGY PUBLICATION 17.0%

Figure 9
Extension and Communication Subprogram budget allocations for 2006/07.

> *The Extension and Communication Subprogram activities serve public, technical, and decision-making audiences.*

FGC Program Extension

The primary extension activities undertaken during the year included:

- A tree improvement field tour held in the Prince George area in conjunction with the Northern Silviculture Committee meeting (June 2006).
- *Tree Improvement in BC* poster printed and made available for communication efforts at seed orchards, research stations, and other sites.
- FGC Extension Note 9, entitled "*Increasing Quality Seed Production in Western Redcedar Orchards: A synthesis of a multi-year foliar-applied gibberellen A_3 study*" by Oldrich Hak and John Russell, was completed.
- TICtalk Volume 7 was prepared and made available on the web and in a print version.
- The publication "*The Reproductive Biology of WesternLarch*" (prepared by J. Owens under contract with the Inland Empire Tree Improvement Cooperative), was formatted for publication as an Extension Note in the FGC Extension Note series.
- An interior pollen management workshop was held in Vernon (November, 2006).

4.6 Genetic Resource Information Management Subprogram

The Genetic Resource Information Management Subprogram supports the development of registries and other tools to aid a broad range of GRM activities. These include registering, cataloguing, and ordering seed and seedlings, improved decision support and client access to information, incorporation of genetic gain into timber supply analyses, assisting with seed deployment and genetic conservation strategies, and monitoring activities and progress.

Figure 10 shows funding allocations to the Genetic Resource Information Management Subprogram activities in the 2006/07 fiscal year.

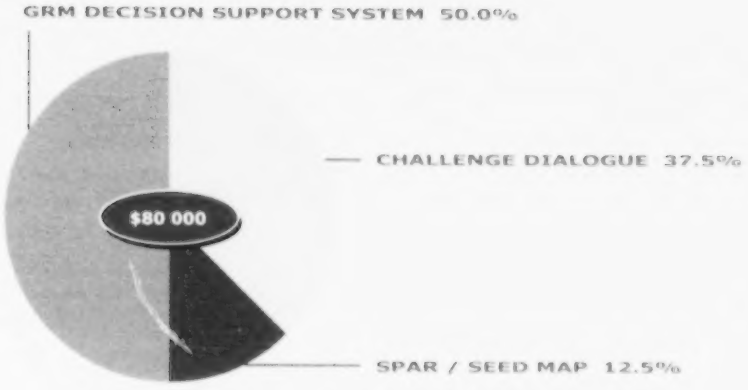


Figure 10
Genetic Resource Information Management Subprogram budget allocations for 2006/07.

Accomplishments

- Support of the GRM Challenge Dialogue process to engage the GRM community of practice and stakeholders in the development of a common vision and strategy.
- Initiation of a multi-year project to develop a GRM decision support system to address new and emerging business requirements such as spatially-enabled seed planning, land based genetic resource stewardship monitoring, performance monitoring (reporting of status and trends of GRM policy and practices), and climate-based seed transfer systems.
- Linkages between the Seed Planning and Registry (SPAR) system and SeedMap were developed to support clients in seed planning, registration, seedling request ordering and in meeting information requirements identified in the Chief Forester's Standards for Seed Use.

> *The Genetic Resource Information Management Subprogram develops tree genetic resource registries and information management tools to assist seed users.*

4.7 Seed Orchard Pest Management Subprogram

The Seed Orchard Pest Management Subprogram supports research, extension activities, and pest management operations to increase orchard yields of high-quality seed. The Pest Management Technical Advisory Committee (PM-TAC) guides investments and activities.

The FGC recognizes the need for a three-level approach to pest management, including basic and applied research by dedicated research staff, applied support from qualified pest management specialists, and operational delivery by orchard staff. Full implementation of this approach occurred during the period of this report.

Contract research was organized via proposals vetted by the Pest Management Research Scientist in consultation with PM-TAC. Research projects undertaken during the 2006/07 fiscal year resulted in the following accomplishments.

> *The seed and cone pest management subprogram coordinates research, extension of information, and operational controls*

Table 3
Seed and cone pest research projects and progress for 2006/07.

Project	Species primarily impacted	Progress
Conifer seed bug (*Leptoglossus occidentalis*): damage control methods	Pli, Fdi, Fdc, Pw	Population levels of *Leptoglossus* seed bug were insufficient to allow this project to proceed
Fir coneworm (*Dioryctia abietivorella*): ID of a sex pheromone lure and the demonstration of its efficacy in orchards (two projects)	Fdi, Fdc, Sx	Pheromone lure optimized, and phenology data collected
Tests of systemic insecticides for cone and seed insect control	All species	Pesticide trials implemented at coastal and interior sites. Seed processing, data collection, and analysis mostly completed
Reducing seed borne *Fusarium* infections in orchard seed to lower seedling mortality; determining infection mechanisms	All species	Cone sampling and analysis, and studies of infested seedlots completed

In addition to research activities, interior and coast pest management specialists provided support to seed orchard operations in their seed and cone pest control efforts.

4.8 Administration

Administration of Forest Investment Account Tree Improvement Program funding is carried out by the MFR Tree Improvement Branch, and includes financial, monitoring, and reporting services. The administrative infrastructure for the Tree Breeding, OTIP, Extension and Communication, and Genetic Resource Information Management Subprograms is provided by the MFR. Administration of the Genetic Conservation and Orchard Expansion Subprograms is provided by the University of British Columbia and SelectSeed Co. Ltd., respectively.

Don Carson

After over 30 years with the Ministry of Forests, Don Carson retired in 2006. Don's career began in Prince George where he was involved with parent tree selections, grafting, and seed orchard development. In 1980 he moved to the Cowichan Lake Research Station as propagation technician, and was later promoted to Station manager. Don responsibilities expanded to also include management of the Kalamalka Forestry Center in Vernon and the Glyn Road Lab near Victoria. Always helpful and cheerful, Don's quick wit and get-it-done approach are missed.

5.0 2006 Orchard Seed Crops

In 2006, all provincial orchards produced a combined crop of about 604 kilograms of seed, sufficient to grow approximately 88 million seedlings (Table 4). Crops from most orchards were up from 2005, but overall, crops were moderate. Lodgepole pine orchards continue to increase substantially, a trend that will continue as young orchards mature. Interior Douglas-fir orchard production is also increasing quickly.

"Provincial seed orchards produced sufficient seed in 2006 for about 88 million seedlings."

Table 4
Summary of 2006 seed crops from all provincial orchards.

Species	Seed produced (kg)	Seedling equivalents (million)
Interior spruce	98.9	13.5
Lodgepole pine	213.3	28.3
Western larch	112.0	10.9
Interior Douglas-fir	13.2	0.5
White pine	133.6	31.7
Western redcedar	5.1	0.9
Sitka spruce	0.2	0.1
Coastal Douglas-fir	20.4	0.7
Western hemlock	7.0	1.3
	603.8	87.8

Clint Hollefreund

Clint retired from the Ministry of Forests in January of 2007 after 32 productive years. Through much of his career Clint worked with the Research Branch as a technician specializing in conifer flower induction of both coastal and interior species. He made important contributions to research that advanced flower induction techniques used in seed orchards. Always focused and well organized, Clint's approach to his work was instrumental in the success of many research projects.

Appendix 1. Seed planning units

Seed planning unit (SPU)				Annual planting[7] (millions)	Program category[8]
#	Species	SPZ	Elev. band (m)		
1	Fdc	M	1-700	11.9	1
2	Cw	M	1-600	7.3	1
3	Hw	M	1-600	1.3	1
4	Sx	NE	1000-1500	4.6	1
5	Sx	NE	1500-1900	5.3	1
6	Ss	M	1-500	1.0	1
7	Pli	NE	700-1400	3.5	1
8	Pw	M/SM	1-1400	0.3	1
9	Ba	M	1-1000	0.9	3
10	Pli	TO	700-1400	14.6	1
11	Yc	M	1-1100	1.4	1
12	Pli	PG	700-1200	38.6	1
13	Lw	NE	700-1200	3.1	1
14	Sx	PG	600-1200	30.6	1
15	Pw	KQ	500-1400	0.9	1
16	Pli	TO	1400-1600	8.0	2
17	Pli	BV	700-1200	17.2	1
18	Pli	CP	700-1100	6.8	1
19	Fdc	SM	200-1000	1.4	2
20	Pli	NE	1400-2000	2.8	3
21	Fdi	NE	400-1000	2.4	1
22	Fdi	NE	1000-1600	3.4	2
23	Sx/Ss	SM/NST	all	0.6	3
24	Hw	M	600-1100	0.9	2
25	Sx	EK	750-1700	1.9	1
26	Pli	PG	1200-2000	5.1	3
27	Cw	SM	200-1000	0.6	3
28	Sx	TO	1300-1900	3.9	1
29	Pli	EK	1500-2000	2.0	3
30	Sx	TO	700-1300	1.4	2
31	Fdc	M	700-1200	1.4	2
32	Pli	EK	800-1500	3.0	2
33	Cw	M	600-1500	1.3	2
34	Lw	EK	800-1500	2.0	1
35	Sx	BV	500-1200	10.4	1
36	Bg	M	1-700	0.1	3
37	Fdi	QL	700-1200	0.7	2
39	Fdi	EK	700-1400	1.1	2
40	Sx	PR	650-1200	5.1	2
41	Fdi	PG	700-1000	2.8	2
42	Sx	PG	1200-1500	2.3	2
43	Fdi	CT	600-1200	1.1	2
44	Sx	NE	1-1000	1.1	2
45	Pli	BB/CHL	all	10.9	3
46	Bl	all int.	all	1.7	3
47	Bn	M	all	0.1	3
48	Aspen/birch/ poplar	Interior	-	NA	3
49	Alder/poplar/ maple	Coast	-	NA	3
50	Lw	NE	1200-1800	1.3	2
51	Py	S. Int.	300-1200	1.1	NA

[7] Annual planting based on 5-year average sowing (2002-2006 sowing years)

[8] Program categories: 1.Advanced-generation program, 2. First-generation program, 3. genecology only, 4. no genetics program.

Forest Genetics Council of BC[9]

Name	Affiliation	Representing	Name	Affiliation	Representing
John Elmslie	Winton Global	Industry Co-Chair	Scott King	Louisiana Pacific	S. interior industry
Dr. Dale Draper	Min. of Forests and Range	MFR Co-Chair	Joe Leblanc	Interfor Ltd.	Coast Industry
Dr. Sally Aitken	University of BC	Coast TAC	Bruce MacNicol	West Fraser Timber Ltd.	Interior industry
Dr. Michael Carlson	Min. of Forests and Range	Interior TAC	Al McDonald	BC Timber Sales	MFR and BCTS
Frank Gundersen	Abitibi Consolidated	N. interior industry	Mike Madill	Min. of Forests and Range	Min. of Forests and Range
Dr. Chris Hawkins	Univ. of Northern BC	University	John Phillips	TimberWest Ltd.	Coast industry
Dr. Gary Hogan	Can. Forest Serv.	Can. Forest Serv.	Dr. Alvin Yanchuk	Min. of Forests and Range	Min. of Forests and Range

Coastal Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Annette van Niejenhuis (Chair)	Western Forest Products	David Reid	Min. of Forests and Range
Dr. Sally Aitken	University of BC	Dr. John Russell	Min. of Forests and Range
Patti Brown	Canadian Forest Products	Brian Saunders	Island Timberlands
Charlie Cartwright	Min. of Forests and Range	Dr. Michael Stoehr	Min. of Forests and Range
Tim Crowder	TimberWest Forests Ltd.	Dr. Joe Webber	ProSeed Consulting
Diane Douglas	Min. of Forests and Range	Dr. Chang-yi Xie	Min. of Forests and Range
Dr. John King	Min. of Forests and Range	Dr. Alvin Yanchuk	Min. of Forests and Range
Dave Kolotelo	Min. of Forests and Range		

Interior Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Dr. Michael Carlson (Chair)	Min. of Forests and Range	Mike Madill	Min. of Forests and Range
Dave Basaraba	Tembec Ltd.	Al McDonald	BC Timber Sales Ltd.
Keith Cox	Min. of Forests and Range	Anna Monetta	Min. of Forests and Range
Vince Day	Canadian Forest Products	George Nicholson	Riverside Forest Products
Diane Douglas	Min. of Forests and Range	Greg O'Neill	Min. of Forests and Range
Hilary Graham	Pacific Regeneration Tech.	Doug Perdue	Dunkley Lumber
Dr. Chris Hawkins	University of Northern BC	David Reid	Min. of Forests and Range
Barry Jaquish	Min. of Forests and Range	Alistair Schroff	Burns Lake Community Forest
Dave Kolotelo	Min. of Forests and Range	Chris Walsh	Min. of Forests and Range
Tim Lee	Vernon Seed Orchard Co.	Bob Johnson	Tolko Industries Ltd.

Extension Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Dr. Chris Hawkins (Chair)	UNBC	Hilary Graham	Pacific Regeneration Tech.
Dr. Michael Carlson	Min. of Forests and Range	Tia Heeley	Vernon Seed Orchard Co.
Charlie Cartwright	Min. of Forests and Range	Roger Painter	Min. of Forests and Range
Keith Cox	Min. of Forests and Range	Jill Peterson	Min. of Forests and Range
Tim Crowder	TimberWest Forests Ltd.	Doug Stables	Global Strategy Inc.
Diane Douglas	Min. of Forests and Range	Kathie Swift	FORREX
Peter Forsythe	The Pas Lumber	Dave Trotter	Min. of Agric. And Lands
Lauchlan Glen	Glenviron Consulting	Jack Woods	Forest Genetics Council

Gene Conservation Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Dr. Sally Aitken	Univ. of BC	Alex Woods	Min. of Forests and Range
Dr. Scott Green	University of N. BC	Jack Woods	Forest Genetics Council
Dr. Andreas Hamann	Univ. of Alberta	Dr. Alvin Yanchuk	Min. of Forests and Range
Dave Kolotelo (Chair)	Min. of Forests and Range		

Pest Management Technical Advisory Committee

Name	Affiliation	Name	Affiliation
Dr. Robb Bennett (Chair)	Min. of Forests and Range	Dave Kolotelo	Min. of Forests and Range
Jim Corrigan	Min. of Forests and Range	Dr. Staffan Lindgren	University of Northern BC
Tim Crowder	TimberWest Forests Ltd.	David Reid	Min. of Forests and Range
Dan Gaudet	Vernon Seed Orchard	Dr. Ward Strong	Min. of Forests and Range
Dr. Peter deGroot	Canadian Forest Service	Jack Woods	Forest Genetics Council

[9] Committee memberships lists represent membership during the period of this report.